Star flat update
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Overview

My star flat code works like an ubercalibration, internally fitting the sensitivity with a spatial parameterization across the chips and/or focal plane. I have tried out a number of different parameterizations such as radial, planar per ccd, higher-order polynomial across the focal plane, and combinations of the above (including ZPs per CCD (or amplifier) and per input image). In general these were not flexible enough to capture well the features of the response.

Recently I have changed my code to use a superpixel parameterization, followed by a fit of a plane across the focal plane. This gives definitely the best results I have seen so far, and seems fairly robust. I am using superpixels of 512x512 pix. The code takes a couple of minutes to run. The following describes results of this fitting of the star flat data set from December.

I am using PSF magnitudes, with cuts on class_star>0.9, flux_radius<4.5, psf mag error<0.1, and flags<4. I welcome any advice on what cuts are recommended.

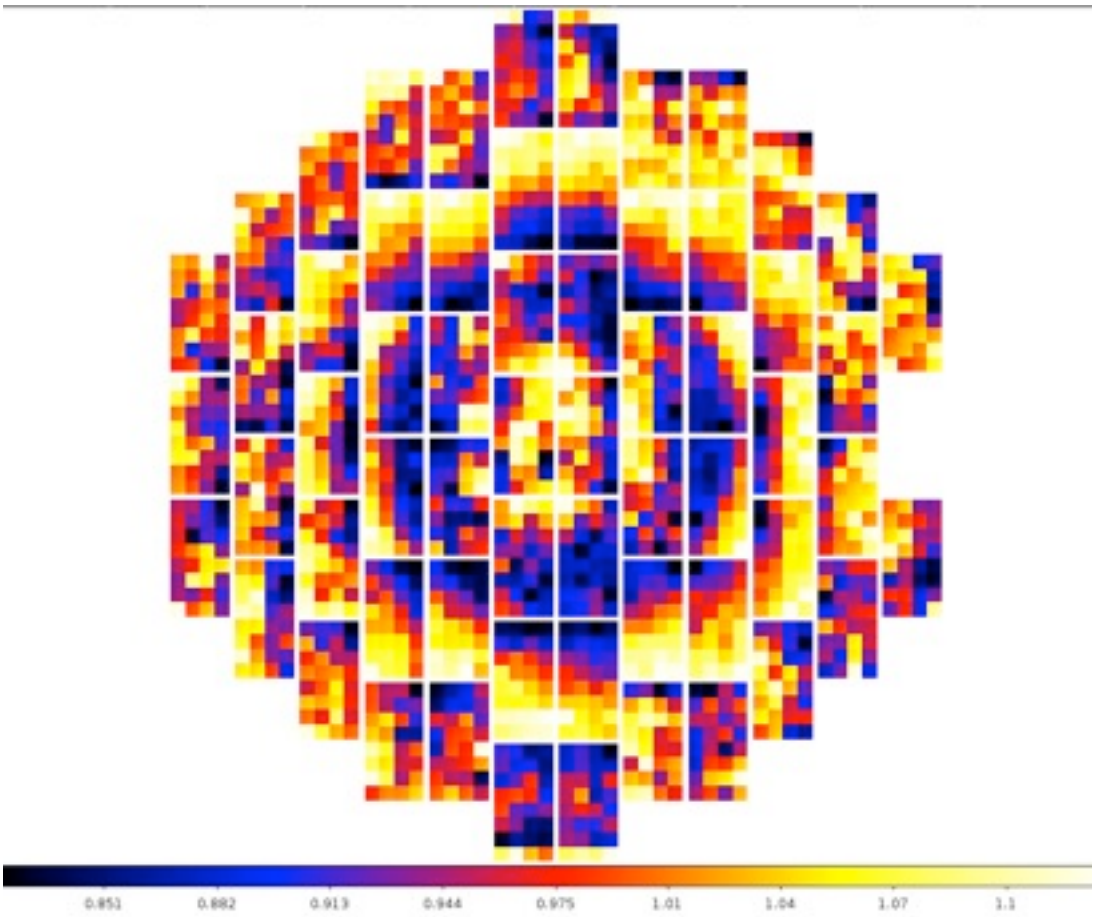
I calculate the RMS of the magnitudes, compared to their mean value, before and after fitting & applying the star flat zeropoints. The mag distributions are non-Gaussian with significant tails, so I should change this to a 68% width or something more robust to choices in clipping (I am currently clipping measurements >0.2 mags from the mean).

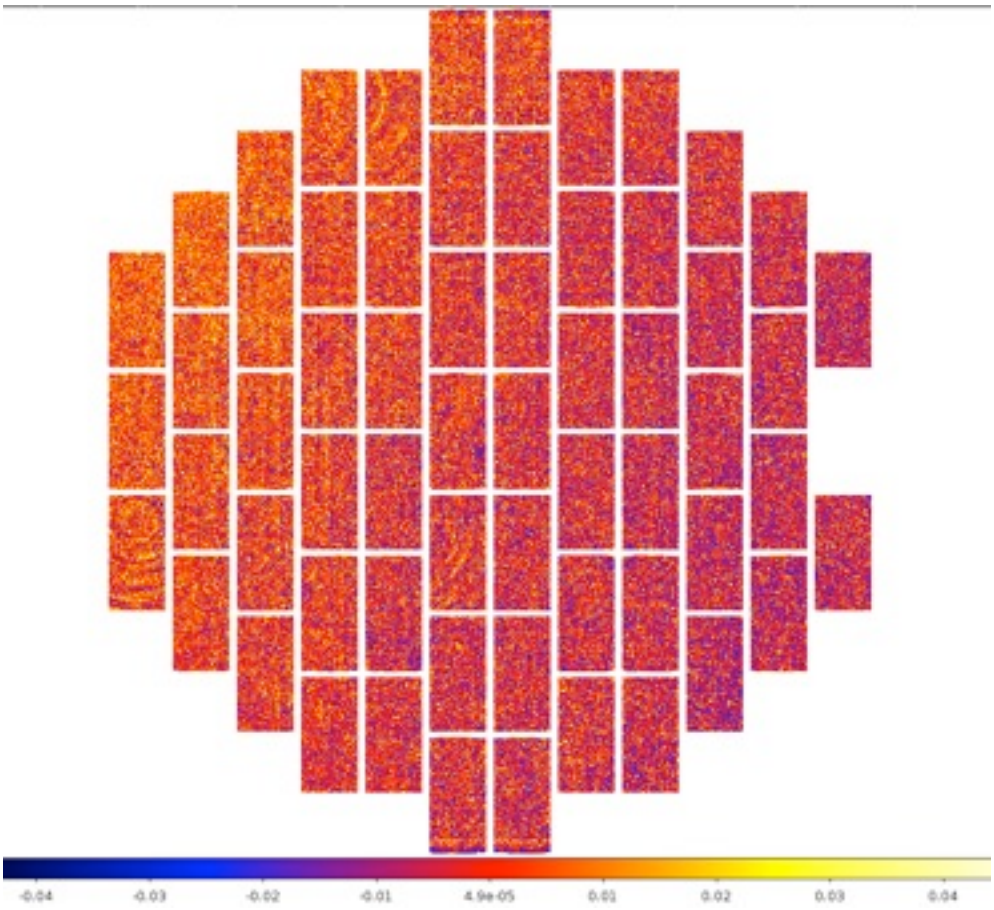
My code outputs a fits file that is the flat field, as well as one showing the residuals from the best-fit. Because the input catalogs have different normalizations per chip there are significant offsets between the chips that are typically larger than, for example, the pupil ghost effect. The flat field images are therefore shown with local scaling (per-ccd), which is why the radial effects look choppy from ccd to ccd. Is there a good way to take out the ccd zero points? Is there a gain saved somewhere that should be included? The residual images are shown with global scaling, since they are all centered around 0.

I am pretty satisfied with how this is running and don't have any major changes planned. Any suggestions?

Results: g band

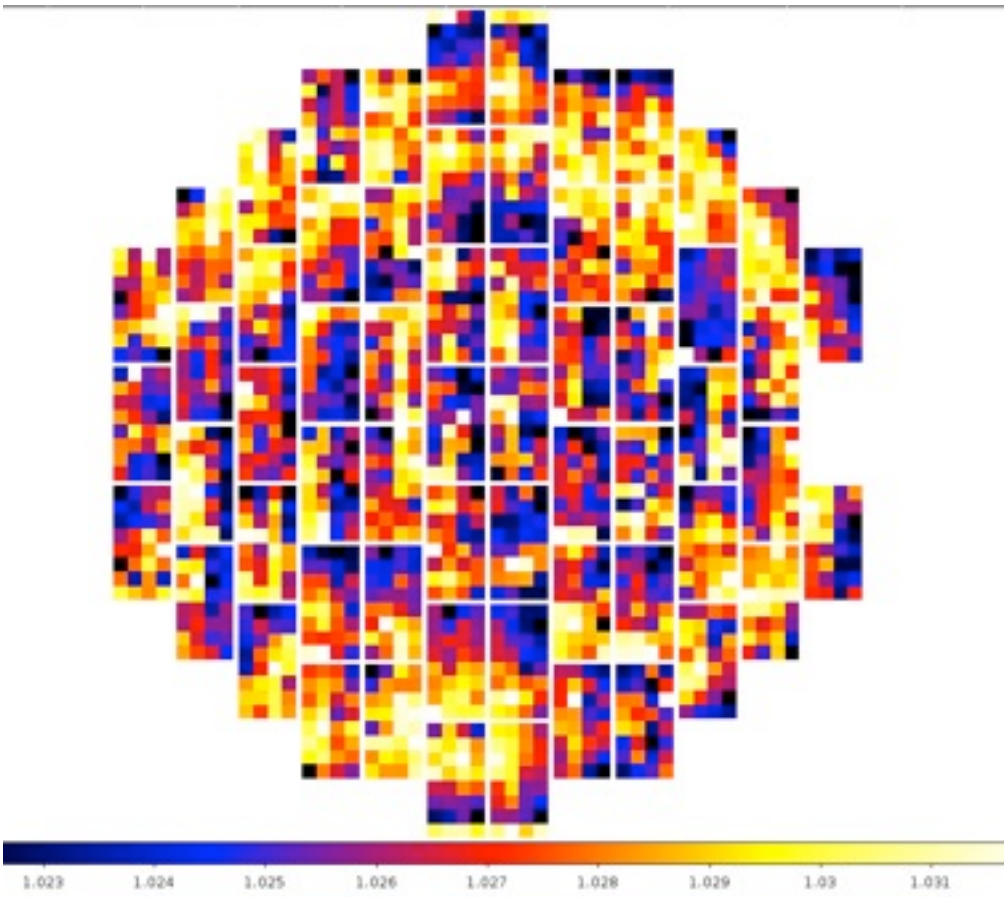
RMS before = 7.0%, after = 2.0%. Note how the residuals are at the level of the CCD manufacturing effects.

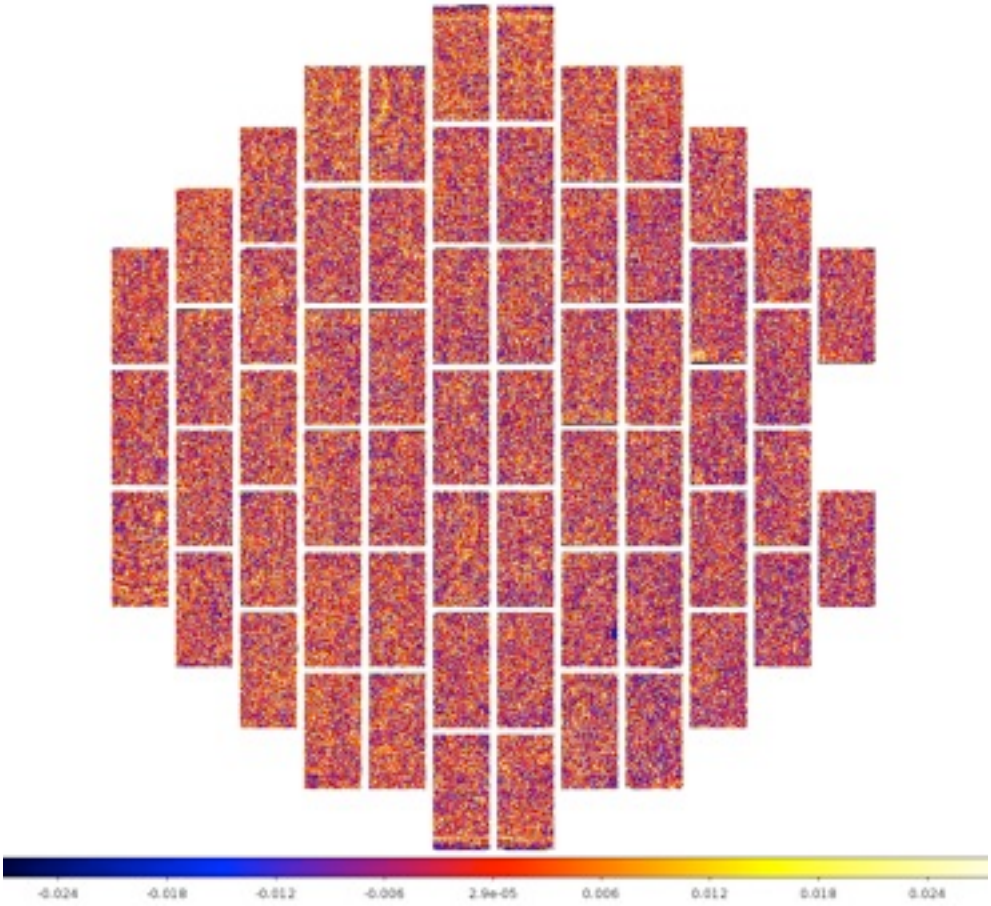




Results: r band

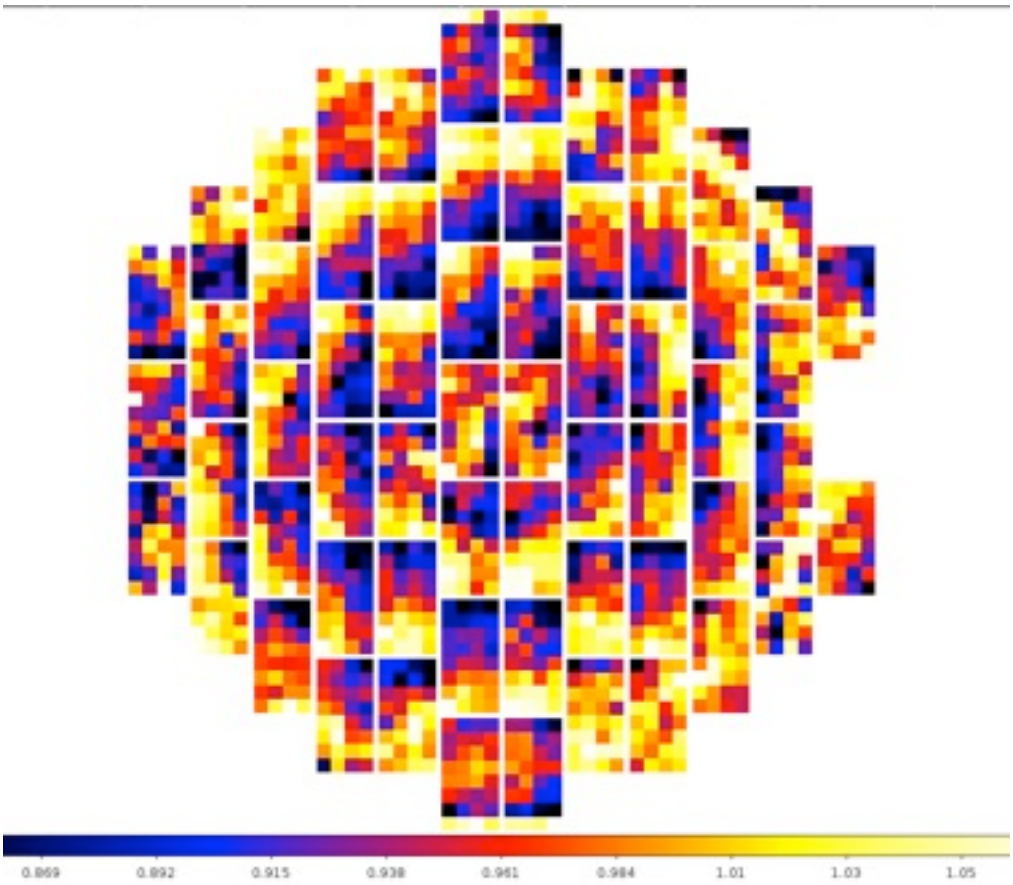
RMS before = 5.4%, after = 2.0%.

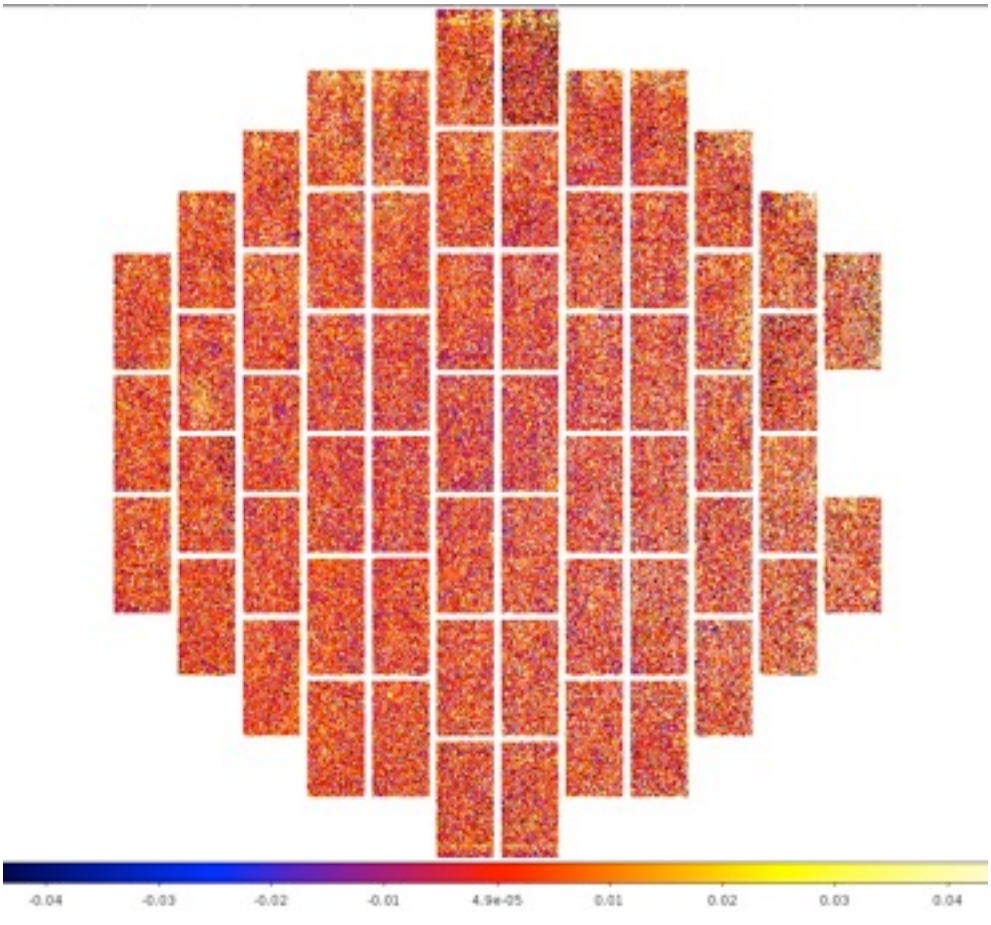




Results: i band

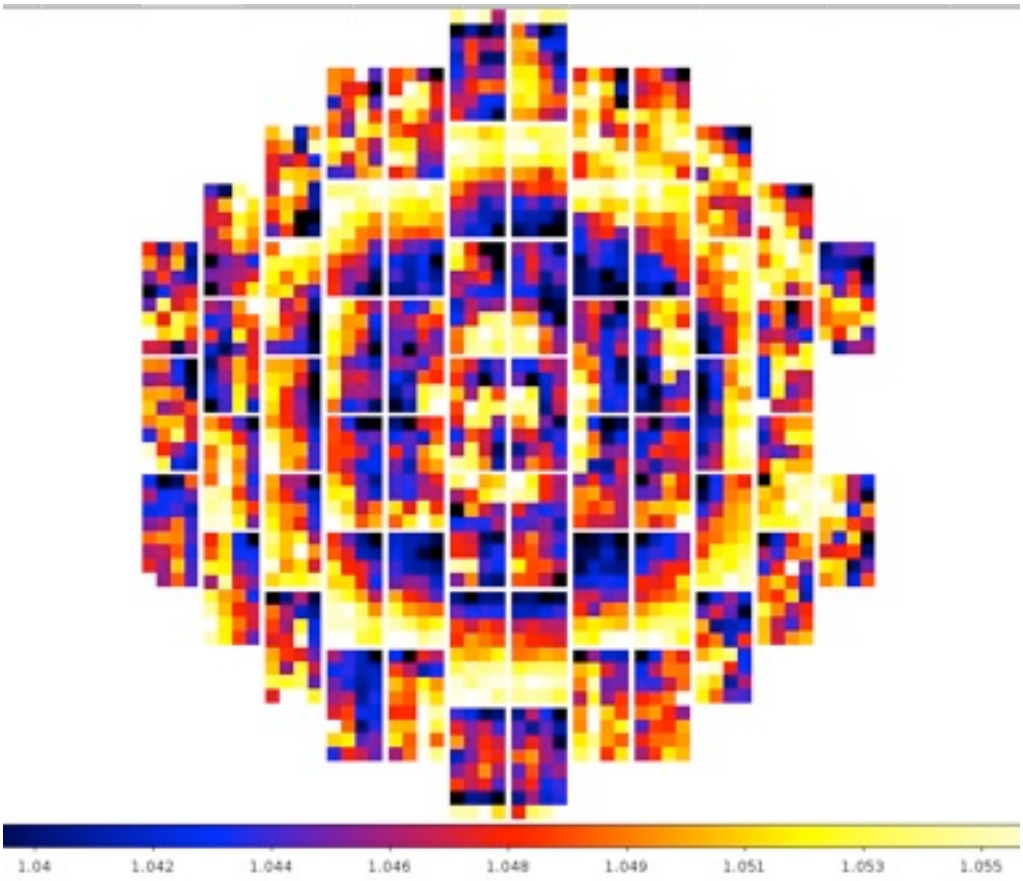
RMS before = 18.7%, after = 2.5%. Why is this data so much worse than the rest? The starting RMS is very bad, and the clipping between the superpixel fit and the plane fit cut out many more objects than usual.

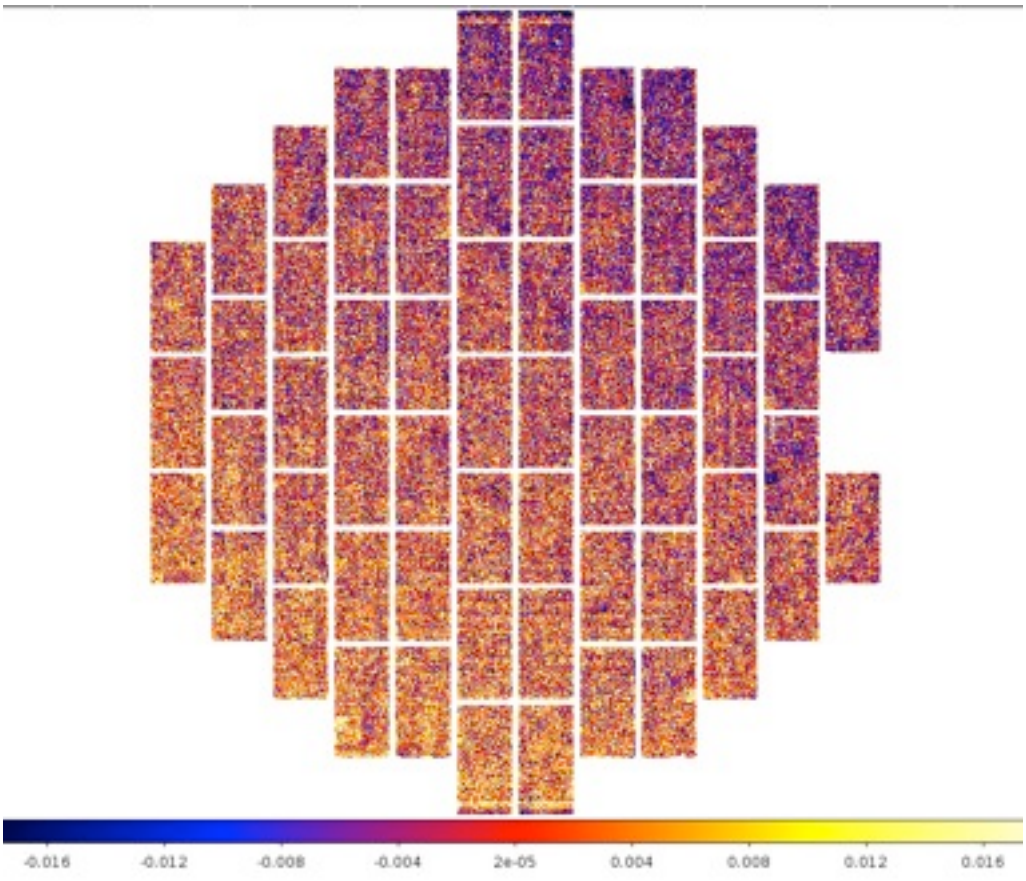




Results: z band

RMS before = 4.2%, after = 1.9%.





Results: y band

RMS before = 4.6%, after = 2.4%.